

about ¼ inch particle size in a “mold” and under a non-oxidizing atmosphere at a heat up rate of from about 1 to about 20°C to a temperature of between about 300 and about 700°C; 2) soaking at a temperature of between about 300 and 700°C for from about 10 minutes up to about 12 hours to form a green foam; and 3)

5 controllably cooling the green foam to a temperature below about 100°C. According to the method described in the aforementioned application, the porous foam product of this process is subsequently preferably carbonized by the application of known techniques, for example, soaking at a temperature of between about 800°C and about 1200°C for a period of from about 1 to about 3 hours. Although this is the
10 preferred temperature range for carbonization, carbonization actually occurs at temperatures between about 600°C and 1600°C.

Graphitization, commonly involves heating the green foam either before or after carbonization at a heat-up rate of less than about 10° C per minute, preferably
15 from about 1° C to about 5° C per minute, to a temperature of between about 1700° C and about 3000° C in an atmosphere of helium or argon and soaking for a period of less than about one hour. Again, the inert gas may be supplied at a pressure ranging from about 0 psi up to a few atmospheres.

20 While carbon foams prepared as just described are useful “as fabricated” for filtering applications, they are not particularly satisfactory in many of these applications because of their relatively low overall surface area of from about 1.0 m²/g to about 2.0 m²/g. It has now been discovered that the filtering ability of such

coal-based carbon foams can be increased, as measured by their overall surface area, by activation with, for example CO₂ or ozone. Such treatment apparently causes pitting of the carbon foam skeleton through oxidation thereof and increases the overall surface area of such materials to a level of between about 10 m²/g to about 25 m²/g, and preferably between about 15 m²/g to about 20 m²/g, depending upon the level, i. e. duration and intensity of the activation procedure. At these overall surface area levels, the carbon foams of the present invention provide excellent monolithic filtration media that exhibit all of the desirable strength, ablation resistance, and ease of fabrication benefits of the parent coal-based carbon foams.

The method of producing the activated carbon foams of the present invention comprises initially: 1) heating a coal particulate of preferably small, i. e. less than about ¼ inch particle size in a “mold” and under an inert or non-oxidizing atmosphere at a heat up rate of from about 1 to about 20°C to a temperature of between about 300 and about 600°C; 2) soaking at a temperature of between about 300 and 600°C for from about 10 minutes up to about 12 hours to form a “green foam”; and 3) controllably cooling the “green foam” to a temperature below about 100°C. The green foam may be subsequently carbonized and/or graphitized as describe hereinafter in an inert or non-oxidizing atmosphere to produce a carbonized or graphitized foam. The inert or non-oxidizing atmosphere may be provided by the introduction of inert or non-oxidizing gas into the “mold” at a pressure of from about 0 psi, i.e., free flowing gas, up to about 500 psi. The inert gas

used may be any of the commonly used inert or non-oxidizing gases such as nitrogen, helium, argon, CO₂, etc.

It is generally not desirable that the reaction chamber or mold be vented or leak during this heating and soaking operation. The pressure of the mold or chamber and the increasing volatile content therein tends to retard further volatilization while the cellular product sinters at the indicated elevated temperatures. If the mold or chamber is vented or leaks during soaking, an insufficient amount of volatile matter may be present to permit inter-particle sintering of the coal particles thus resulting in the formation of a sintered powder as opposed to the desired cellular product. Thus, according to a preferred embodiment of the present process, venting or leakage of non-oxidizing gas and generated volatiles is inhibited consistent with the production of an acceptable cellular product.

Additional more conventional blowing agents may be added to the particulate prior to expansion to enhance or otherwise modify the pore-forming operation.

The term "mold", as used herein is meant to define any mechanism for providing controlled dimensional forming of the expanding coal or carbon or containing the foaming operation. Thus, any chamber into which the coal particulate and carbide precursor blend is deposited prior to or during heating and